



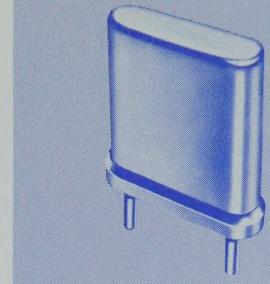
The items listed on these pages are intended to aid the user of quartz crystals in the construction of experimental and operational circuits. Some items are available in kit form and other units are complete for production use.

In addition to the .02% calibration tolerance crystals, International supplies a complete line of quartz crystals for general purpose applications as well as crystals for specific communication equipment. Crystals can be supplied to your specific load capacitance requirements and selected holder and temperature specifications.

All International products carry a six digit Catalog Number. A detailed discussion of the catalog number system is included with the full ICM Catalog Information. When ordering, the use of Catalog Numbers will expedite the handling of your order.

Inquiries and correspondence may be addressed to:

ICM Customer Service Department  
Post Office Box 32497  
Oklahoma City, OK 73132



## .02% CALIBRATION TOLERANCE EXPERIMENTER CRYSTALS

(HC 6/U Holder)

### CAT. NO. SPECIFICATIONS

031080	3 to 20 MHZ .02% calibration— For use in OX OSC LO. Specify when ordering.	\$5.95 ea.
031081	20 to 60 MHZ .02% calibration— For use in OX OSC HI. Specify when ordering.	\$5.95 ea.
031300	3 to 20 MHZ .02% calibration— For use in OF-1L OSC. Specify when ordering.	\$4.75 ea.
031310	20 to 60 MHZ .02% calibration— For use in OF-1H OSC. Specify when ordering.	\$4.75 ea.

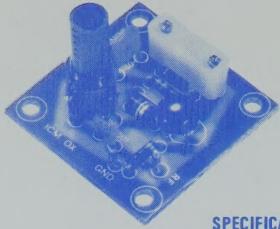
For other crystals see ICM Crystal Catalog information.

**SPECIFICATIONS:** International .02% Experimenter Crystal is available from 3,000 KHZ to 60,000 KHZ. Experimenter Crystals are supplied only in the HC-6/U holder with calibration  $\pm .02\%$  to operate in the OX or OF-1 oscillator circuits. OF-1 uses special correlated crystal units. Check crystal catalog numbers listed with each oscillator.

**CONDITIONS OF SALE:** Crystals are guaranteed to operate only in International circuit or equivalent. Sold on a cash basis. Shipping and postage (inside U. S., Canada and Mexico only) will be prepaid by International.

**ORDERING INSTRUCTIONS:** (1) Order by catalog number. (2) Specify crystal frequency. (3) Enclose check or money order with your order. (4) Sold only under the conditions specified herein.

**FOREIGN ORDERS:** Prices quoted for U.S., Canada and Mexico orders only. Orders for shipment to other countries will be quoted on request. Minimum foreign order \$25.00 (exclusive Canada and Mexico).



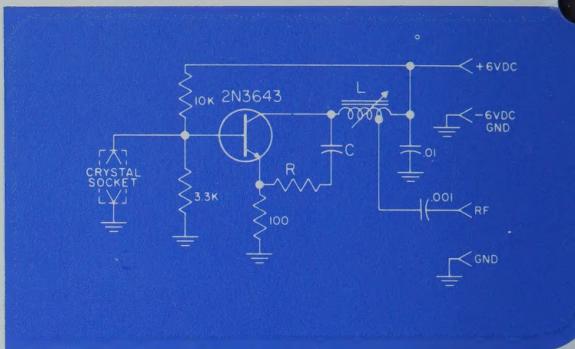
## OX OSCILLATOR

### SPECIFICATIONS

1. Frequency Range	LO Kit 3 to 20 MHZ HI kit 20 to 60 MHZ
2. RF Output	.2 volts rms into 50 ohms (min)
3. DC Power Required	6 volts at 20 ma (operates 4 to 9 volts)
4. Frequency Tolerance with Cat. No. 031080 and Cat. No. 031081 crystals	.02%
5. Operating Temperature Range	0 to 50 Degrees Centigrade
6. Frequency Change with 1 Volt Supply Change	.001% (max)
7. Output Level Change with 1 Volt Supply Change	.2 db (approx)
8. Size	1-1/2" x 1-1/2" x 1-1/4"
9. Mounting	4 holes with spacers or fits over 1-1/4" chassis hole

Complete (less crystal)  
LO Kit Cat. No. 035100 . . . . . \$4.95  
HI Kit Cat. No. 035101 . . . . . 4.95  
Specify when ordering.

The OX oscillator is an inductor/capacitor broadtuned circuit. Kit includes coils with adjustable core. In the fundamental range the circuit presents an approximate load of 100 pf to the crystal. In the overtone range the crystal operates at near series resonance.



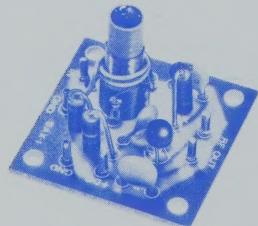
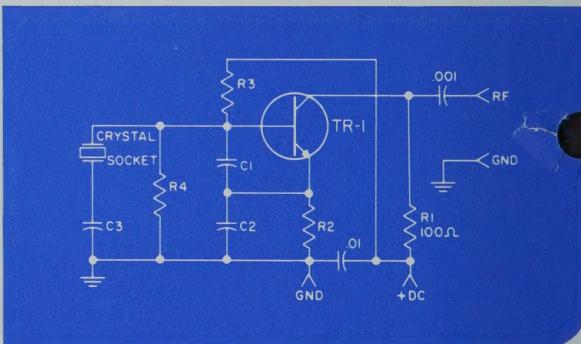
## OF-1 OSCILLATOR

### SPECIFICATIONS

1. Frequency Range	LO - 2 MHZ to 22 MHZ (For Fundamental Xtal) HI - 18 MHZ to 60 MHZ (Overtone Xtal)
2. RF output	.1 volt rms into 50 ohms (min)
3. DC power required	9 volts at 20 ma (operates 6 to 12 volts)
4. Frequency tolerance with OF-1 and Cat. No. 031300 or Cat. No. 031310 crystals	.02%
5. Operating temperature range	0 to 50 degrees centigrade
6. Frequency change with 1 volt supply change	.001% (max)
7. Output level change with 1 volt supply change	.2 db (approx)
8. Size	1-1/2" x 1-1/2" x 1"
9. Mounting	4 holes with spacers or fits over 1-1/4" chassis hole
10. Matching Crystal Part No.	Fundamental Cat. No. 031300 \$4.25 ea. Overtone Cat. No. 031310 \$4.25 ea. Specify Crystal Part No. and Frequency.

Complete Osc. Kit (less crystal)  
LO Kit Cat. No. 035108 . . . . . \$4.25  
HI Kit. Cat. No. 035109 . . . . . 4.25

The OF-1 oscillator is a resistor/capacitor circuit providing oscillation over a range of frequencies by merely inserting the desired crystal. The crystal/oscillator combination is intended for general purpose use. The output is -10 dbm nominal. The output frequency may be adjusted slightly by changing the value of capacitor C3. In the fundamental range the circuit presents an average load of 24 pf to the crystal. In the overtone range the crystal operates near series resonance.



## SAX-1 TRANSISTOR RF AMPLIFIER

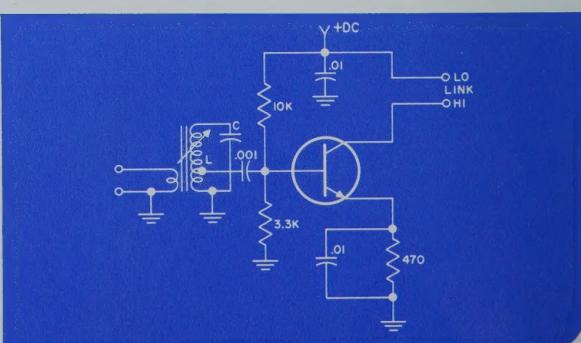
### SPECIFICATIONS

1. DC Power Required	6 to 12 volts dc @ 7 ma
2. Frequency Range	LO Kit 3 to 20 MHZ HI Kit 20 to 170 MHZ
3. Gain	15 db at 3 MHZ 10 db at 150 MHZ
4. Sensitivity	Useful to 1 microvolt
5. Input Coupling	Low Impedance link
6. Output Coupling	Low Impedance link to next stage (link carries dc to collector)
7. Size	1-1/2" x 1-1/2" x 1"
8. Mounting	4 holes with spacers

Specify HI or LO kit when ordering.

Complete  
LO Kit Cat. No. 035102 . . . . . \$5.50  
HI Kit Cat. No. 035103 . . . . . 5.50

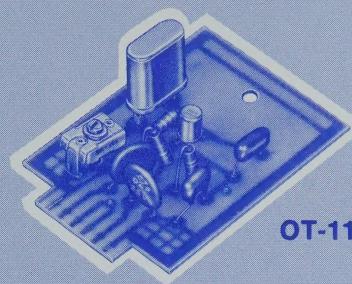
The SAX-1 transistor rf amplifier is intended as a small signal amplifier to drive the MX-1 mixer. The circuit has a single tuned input and a link output to the next stage. This output link carries dc to the collector of the amplifier transistor.





# Plug-in Transistor Oscillators

Direct crystal control to 160 MHz



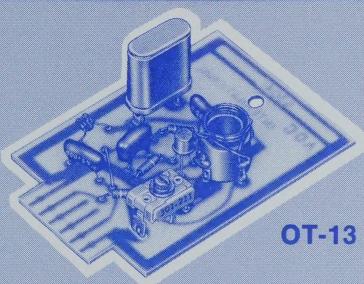
OT-1160

## HIGH FREQUENCY (20 MHz — 160 MHz)

- Signal Generators For Receiver Alignment
- Quick-Change Plug-In Oscillators

Five transistor oscillators covering 20 MHz — 160 MHz. Standard 77°F calibration tolerance  $\pm .0025\%$ . The frequency tolerance is  $\pm .0035\%$ . Oscillator output is .2 volts (min.) across 51 ohms. Power requirement: 9 vdc @ 10 ma. max.

Catalog Number	Oscillator Type	Oscillator Range	Temperature Tol. -40°F to 150°F	Oscillator (Less Crystal) Price
035200	OT-124	20-40 MHz	$\pm .0035\%$	\$8.00
035201	OT-146	40-60 MHz	$\pm .0035\%$	8.00
035202	OT-161	60-100 MHz	$\pm .0035\%$	8.00
035203	OT-1140	100-140 MHz	$\pm .0035\%$	8.00
035204	OT-1160	145-160 MHz	$\pm .0035\%$	8.00



OT-13

## LOW FREQUENCY (70 KHz - 20,000 KHz)

- Band Edge Markers
- Frequency Markers For Oscilloscopes

- Portable Signal Standards
- Accessory Cases

Four transistor oscillators covering 70 KHz — 20,000 KHz. Trimmer capacitor for zeroing crystal. When oscillator is ordered with crystal the standard will be  $\pm .0025\%$ . Oscillator output is 1 volt (min.) across 470 ohms. Power requirement: 9 vdc @ 10 ma. max.

Catalog Number	Oscillator Type	Oscillator Range	Temperature Tol. -40°F to 150°F	Oscillator (Less Crystal) Price
035205	OT-11	70-150 KHz	$\pm .015\%$	\$8.00
035206	OT-12A	150-400 KHz	200-600 KHz $\pm .01\%$	8.00
035207	OT-12	400-5,000 KHz	600-5,000 KHz $\pm .0035\%$	8.00
035208	OT-13	2,000-12,000 KHz	$\pm .0035\%$	8.00
035209	OT-14	10,000-20,000 KHz	$\pm .0035\%$	8.00

## SUPPLEMENTAL CRYSTAL ORDERING INFORMATION FOR ICM OSCILLATORS

Please refer to the "4" Series Crystal Specification Sheets. Prices on crystals will vary with frequency being ordered.

### CALIBRATION TEMPERATURE:

Customer's choice, usually 26°C.

RANGE: Depends on crystal frequency being ordered.

TYPE: CS (2) is recommended.

### HOLDER:

F-605 (1) for all except crystals below 160 KHz.

F-13 (8) required for crystals below 160 KHz.

### LOAD:

OT-11, OT-12, OT-12A ..... 24PF (4)

OT-13, OT-14 ..... 20PF (3)

OT-124, OT-146, OT-161,

OT-1140, OT-1160 ..... SERIES (0)

ALIGNMENT OSCILLATORS,

Models 812, 814 ..... 32PF (5)

Note: Circled numbers refer to numbers on Crystal Specification Sheets.

### EXAMPLES

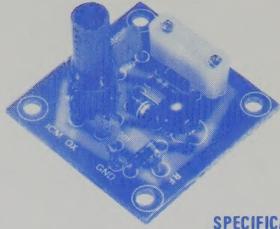
OT-11 Catalog Number = 4 1 1 2 8 4  
(75 KHz\*, CS, F-13 Holder, 24PF)

OT-14 Catalog Number = 4 3 3 2 1 3  
(10.5 MHz\*, CS, F-605 Holder, 20PF)

OT-1140 Catalog Number = 4 7 4 2 1 0  
(120 MHz\*, CS, F-605 Holder, Series)

\*All "4" Series Catalog Numbers require crystal frequency specified by Customer.

# OX OSCILLATOR

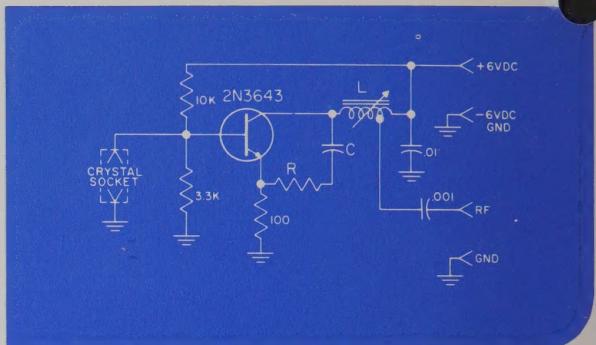


## SPECIFICATIONS

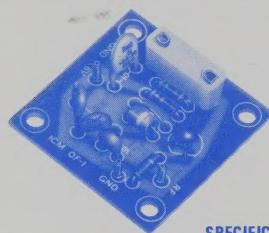
1. Frequency Range	LO Kit 3 to 20 MHZ HI Kit 20 to 60 MHZ
2. RF Output	2 volts rms into 50 ohms (min)
3. DC Power Required	6 volts at 20 ma (operates 4 to 9 volts)
4. Frequency Tolerance with Cat. No. 031080 and Cat. No. 031081 crystals	.02%
5. Operating Temperature Range	0 to 50 Degrees Centigrade
6. Frequency Change with 1 Volt Supply Change	.001% (max)
7. Output Level Change with 1 Volt Supply Change	.2 db (approx)
8. Size	1-1/2" x 1-1/2" x 1-1/4"
9. Mounting	4 holes with spacers or fits over 1-1/4" chassis hole

Complete (less crystal)  
LO Kit Cat. No. 035100 . . . . . \$4.95  
HI Kit Cat. No. 035101 . . . . . 4.95  
Specify when ordering.

The OX oscillator is an inductor/capacitor broadtuned circuit. Kit includes coils with adjustable core. In the fundamental range the circuit presents an approximate load of 100 pf to the crystal. In the overtone range the crystal operates at near series resonance.



# OF-1 OSCILLATOR

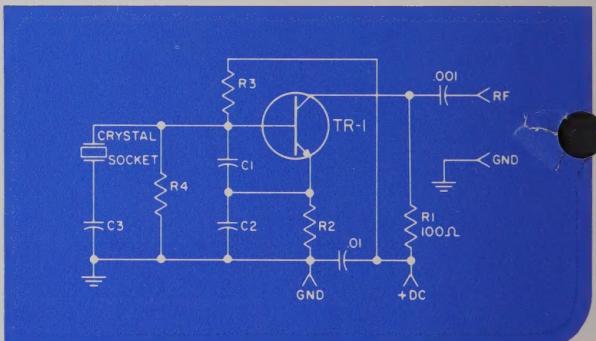


## SPECIFICATIONS

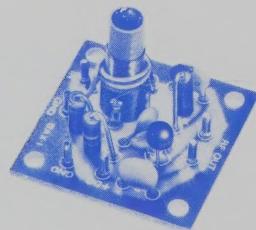
1. Frequency Range	LO - 2 MHZ to 22 MHZ (For Fundamental Xtal) HI - 18 MHZ to 60 MHZ (Overtone Xtal)
2. RF output	1 volt rms into 50 ohms (min)
3. DC power required	9 volts at 20 ma (operates 6 to 12 volts)
4. Frequency tolerance with OF-1 and Cat. No. 031300 or Cat. No. 031310 crystals	.02%
5. Operating temperature range	0 to 50 degrees centigrade
6. Frequency change with 1 volt supply change	.001% (max)
7. Output level change with 1 volt supply change	.2 db (approx)
8. Size	1-1/2" x 1-1/2" x 1"
9. Mounting	4 holes with spacers or fits over 1-1/4" chassis hole
10. Matching Crystal Part No.	Fundamental Cat. No. 031300 \$4.25 ea. Overtone Cat. No. 031310 \$4.25 ea. Specify Crystal Part No. and Frequency.

Complete Osc. Kit (less crystal)  
LO Kit Cat. No. 035108 . . . . . \$4.25  
HI Kit. Cat. No. 035109 . . . . . 4.25

The OF-1 oscillator is a resistor/capacitor circuit providing oscillation over a range of frequencies by merely inserting the desired crystal. The crystal/oscillator combination is intended for general purpose use. The output is -10 dbm nominal. The output frequency may be adjusted slightly by changing the value of capacitor C3. In the fundamental range the circuit presents an average load of 24 pf to the crystal. In the overtone range the crystal operates near series resonance.



# SAX-1 TRANSISTOR RF AMPLIFIER

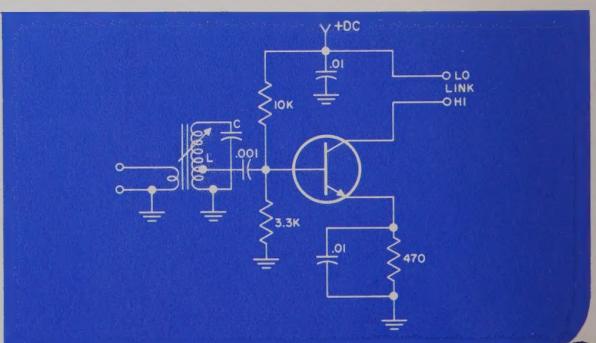


## SPECIFICATIONS

1. DC Power Required	6 to 12 volts dc @ 7 ma
2. Frequency Range	LO Kit 3 to 20 MHZ HI Kit 20 to 170 MHZ
3. Gain	15 db at 3 MHZ 10 db at 150 MHZ
4. Sensitivity	Useful to 1 microvolt
5. Input Coupling	Low Impedance link
6. Output Coupling	Low Impedance link to next stage (link carries dc to collector)
7. Size	1-1/2" x 1-1/2" x 1"
8. Mounting	4 holes with spacers Specify HI or LO kit when ordering.

Complete  
LO Kit Cat. No. 035102 . . . . . \$5.50  
HI Kit Cat. No. 035103 . . . . . 5.50

The SAX-1 transistor rf amplifier is intended as a small signal amplifier to drive the MXX-1 mixer. The circuit has a single tuned input and a link output to the next stage. This output link carries dc to the collector of the amplifier transistor.





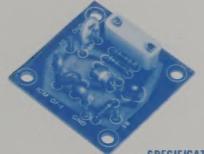
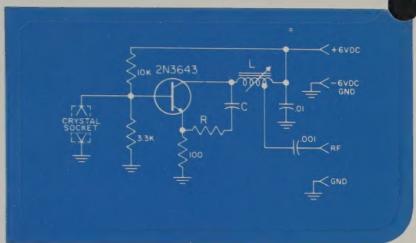
## OX OSCILLATOR

### SPECIFICATIONS

1. Frequency Range ..... LO Kit 3 to 20 MHz  
HI Kit 20 to 60 MHz
2. RF Output ..... 2 volts rms into 50 ohms (min)  
6 volts at 20 ma (operates 4 to 9 volts)
3. DC Power Required ..... .02%
4. Frequency Tolerance with Cat. No. 031080 and Cat. No. 031081 crystals ..... 0.02%
5. Operating Temperature Range ..... 0 to 50 Degrees Centigrade
6. Frequency Change with 1 Volt Supply Change ..... 0.001% (max)
7. Output Level Change with 1 Volt Supply Change ..... 2 db (approx)
8. Size ..... 1-1/2" x 1-1/2" x 1-1/4"
9. Mounting ..... 4 holes with spacers or fits over 1-1/4" chassis hole

Complete (less crystal)  
LO Kit Cat. No. 035100 ..... \$4.95  
HI Kit Cat. No. 035101 ..... 4.95  
Specify when ordering.

The OX oscillator is an inductor/capacitor broadtuned circuit. Kit includes coils with adjustable core. In the fundamental range the circuit presents an approximate load of 100 pf to the crystal. In the overtone range the crystal operates at near series resonance.



## OF-1 OSCILLATOR

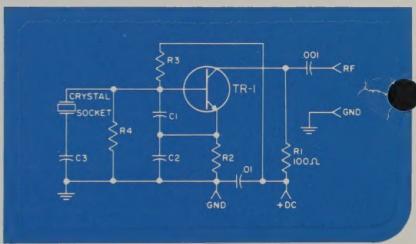
### SPECIFICATIONS

1. Frequency Range ..... LO - 2 MHz to 22 MHz  
(For Fundamental Xtal)  
HI - 18 MHz to 60 MHz  
(Overtone Xtal)
2. RF output ..... 1 volt rms into 50 ohms (min)  
9 volts at 20 ma (operates 6 to 12 volts)
3. DC power required ..... .02%
4. Frequency tolerance with OF-1 and Cat. No. 031300 or Cat. No. 031310 crystals ..... 0.02%
5. Operating temperature range ..... 0 to 50 degrees centigrade
6. Frequency change with 1 volt supply change ..... 0.001% (max)
7. Output level change with 1 volt supply change ..... 2 db (approx)
8. Size ..... 1-1/2" x 1-1/2" x 1"
9. Mounting ..... 4 holes with spacers or fits over 1-1/4" chassis hole

Fundamental Cat. No. 031300 \$4.25 ea.  
Overtone Cat. No. 031310 \$4.25 ea.  
Specify Crystal Part No. and Frequency.

Complete Osc. Kit (less crystal)  
LO Kit Cat. No. 035108 ..... \$4.25  
HI Kit Cat. No. 035109 ..... 4.25

The OF-1 oscillator is a resistor/capacitor circuit providing oscillation over a range of frequencies by merely inserting the desired crystal. The crystal/oscillator circuit is intended for general purpose use. The output is -10 dbm nominal. The output frequency may be adjusted slightly by changing the value of capacitor C3. In the fundamental range the circuit presents an average load of 24 pf to the crystal. In the overtone range the crystal operates near series resonance.



## SAX-1 TRANSISTOR RF AMPLIFIER

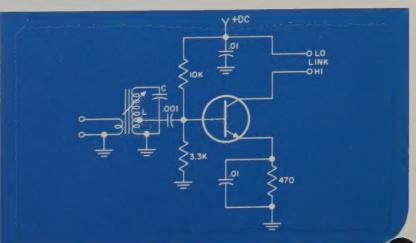
### SPECIFICATIONS

1. DC Power Required ..... 6 to 12 volts dc @ 7 ma
2. Frequency Range ..... LO Kit 3 to 20 MHz  
HI Kit 20 to 170 MHz
3. Gain ..... 15 db at 3 MHz  
10 db at 150 MHz
4. Sensitivity ..... Useful to 1 microvolt
5. Input Coupling ..... Low Impedance link to next stage
6. Output Coupling ..... Low Impedance link to next stage. Output carries dc to the collector of the amplifier transistor
7. Size ..... 1-1/2" x 1-1/2" x 1"
8. Mounting ..... 4 holes with spacers

Specify HI or LO kit when ordering.

Complete  
LO Kit Cat. No. 035102 ..... \$5.50  
HI Kit Cat. No. 035103 ..... 5.50

The SAX-1 transistor rf amplifier is intended as a small signal amplifier to drive the MXX-1 mixer. The circuit has a single tuned input and a link output to the next stage. This output link carries dc to the collector of the amplifier transistor.



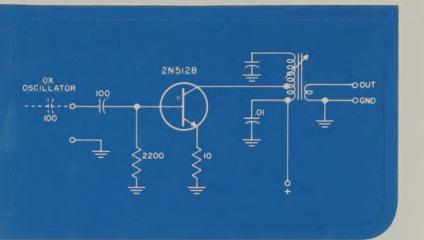
## PAX-1 TRANSISTOR RF POWER AMPLIFIER

### SPECIFICATIONS

1. DC Power Required ..... 6 to 12 volts dc @ 20 to 50 ma
2. Frequency Range ..... 3 to 30 MHz
3. Output ..... 30 mw to 200 mw depending on voltage
4. Drive Required ..... OX or OF oscillators
5. Output ..... Low impedance link
6. Harmonics ..... Down at least 20 db
7. Size ..... 1-1/2" x 1-1/2" x 1"
8. Mounting ..... 4 holes with spacers

Complete Kit Cat. No. 035104 ..... \$5.75

The PAX-1 transistor rf power amplifier is a single tuned output amplifier designed to follow the OX oscillator. Outputs up to 200 mw can be obtained depending on the frequency and the voltage. The amplifier can be amplitude modulated for low power communications.



## ICM



### MT-1



### FOT-10

Basic case with battery and output jack for general wider tolerance applications  
Cat. No. 035210

\$15.50

### MT-1

Oscillator board mounting kit. Provides mounting for International plug-in transistor oscillators. Six contact "T" series mounting with shield.  
Cat. No. 035211

\$5.95

### MT-2

Six contact socket and plate for oscillator case.  
Cat. No. 035212

\$3.50

## OE Crystal Oscillator Elements



OE series of Crystal Oscillator Elements provide a complete crystal controlled signal source. The OE units cover the range 2000 KHz to 160 MHz. The standard OE unit is designed to mount direct on a printed circuit board. Also available is printed circuit board plug-in type.

The various OE units are divided into groups by frequency and by temperature stability. Models OE-20 and OE-30 are temperature-compensated units. The listed "Overall Accuracy" includes room temperature or 25° C tolerance and may be considered a maximum value rather than nominal.

All OE units are designed for 9.5 to 15 volts dc operation. The OE-20 and OE-30 require a regulated source to maintain the listed tolerance with input supply less than 12 vdc.

Prices listed include oscillator and crystal. For the plug-in type add the suffix "P" after the OE number; eg OE-1P.

OE-1, 5 and 10 can be supplied to operate at 5 vdc with reduced rf output. Specify 5 vdc when ordering.

Output - 10 dbm min. All oscillators over 60 MHz do not have frequency adjust trimmers.

Catalog Number	Oscillator Element Type	2000 KHz to 50 MHz	51 MHz 139 MHz	140 MHz 160 MHz	Overall Accuracy	25°C Tolerance
035213	OE-1	\$13.50				
035214	OE-1		\$15.50	\$19.50	± .01%	-30° to +60°C
035215	OE-1				± .005%	
035216	OE-5	\$16.75			± .005%	2-60MHz
035217	OE-5		\$19.75		± .001%	-10° to +60°C
035218	OE-5			\$26.00	61 to 139 MHz ± .025%	140 to 160 MHz
Catalog Number	Oscillator Element Type	3000 KHz to 20000 KHz			Overall Accuracy	25°C Tolerance
035219	OE-10		\$19.75		± .0005%	-10° to +60°C
035220	OE-20		\$29.00		± .0005%	-30° to +60°C
035221	OE-30		\$60.00		± .0002%	-30° to +60°C

# Accessories

## AC-95 ADAPTER

WITH HOLD DOWN BRACKET

Similar to AC-95 Adapter. Includes metal hold down bracket for replacement of Motorola SFMT-2 Holder. Cat. No. 035000 ..... \$3.00



## AC-95 ADAPTER

Will adapt F-609 or GP-09 crystal to fit standard 5 prong tube socket.

Cat. No. 035001 ..... \$1.50



## AC-9 CRYSTAL SOCKET

Phenolic to fit F-609 or GP-09.

Cat. No. 035002 ..... \$.40  
Cat. No. 035003, Pkg. 10 3.00



## AC-5 CRYSTAL SOCKET

Ceramic to fit F-605 or GP-05.

Cat. No. 035004 ..... \$.40  
Cat. No. 035005, Pkg. 10 3.00



## FM-2 CRYSTAL SOCKET

Special socket for printed circuit board. For type FM-2 crystal.

Cat. No. 035006 ..... \$.40  
Cat. No. 035007, Pkg. 10 3.00



## F-605 (Regular) CRYSTAL SOCKET

Special socket for printed circuit board. For type F-605 crystal.

Cat. No. 035008 ..... \$.40  
Cat. No. 035009, Pkg. 10 3.00



## FI-4 CRYSTAL SOCKET

Special socket for printed circuit board. For type FI-4 crystal.

Cat. No. 035010 ..... \$.40  
Cat. No. 035011, Pkg. 10 3.00



## SMALL SIGNAL PICK-OFF ATTENUATOR

International's inline barrel attenuators are for use with frequency meters to supply a small amount of rf voltage for measurement purposes. Two models are available, 150-285 for general purpose and low frequency work; and 105-286 for high frequency measurements. The 150-286 attenuator should be used in the 450 MHz range where minimum insertion loss is desired.

	\$24.00 Model 150-285 Cat. No. 035012	\$26.00 Model 150-286 Cat. No. 035013
less than .2 db	less than .2 db	Insertion loss 30 MHz
less than .2 db	less than .2 db	Insertion loss 170 MHz
less than 4.00 db	less than .75 db	Insertion loss 460 MHz
less than 28 db	less than 46 db	Minimum attenuation 30 MHz
less than 14 db	less than 28 db	Minimum attenuation 170 MHz
less than 8 db	less than 22 db	Minimum attenuation 460 MHz

Maximum attenuation both models is greater than 60 db. The attenuation required to deliver 250,000 microvolts to the frequency meter with several line powers is listed below.

Power Watts	Attenuation DB
1	29
10	39
50	46
250	53